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1	11341	buoy or sonobuoy	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 12:54
2	0	(buoy or sonobuoy) same (manatee\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 12:54
3	13	(buoy or sonobuoy) same (mammal\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:05
4	508	367/131.ccls. or 340/573.2.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:05

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1 Acoustic detection of manatee vocalizations.

2 The underwater audiogram of the West Indian manatee (*Trichechus manatus*).

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### INSPEC - 1969 to date (INZZ)

#### Accession number & update

7739262, A2003-21-8736-006; 20030929.

#### Title

Acoustic detection of manatee vocalizations.

#### Author(s)

Niezrecki-C; Phillips-R; Meyer-M; Beusse-D-O.

#### Author affiliation

Dept of Mech & Aerosp Eng, Univ of Florida, Gainesville, FL, USA.

#### Source

Journal-of-the-Acoustical-Society-of-America (USA), vol.114, no.3, p.1640-7, Sept. 2003. , Published:  
Acoust. Soc. America through AIP.

#### CODEN

JASMAN.

#### ISSN

ISSN: 0001-4966, CCCC: 01/01/4966/2003/114(3)/1640/8/ (\$19.00).

#### Availability

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Electronic Journal Document Number: S0001-4966(03)01209-8.

#### Publication year

2003.

#### Language

EN.

#### Publication type

J Journal Paper.

#### Treatment codes

T Theoretical or Mathematical.

#### Abstract

The West Indian manatee (*trichechus manatus latirostris*) has become endangered partly because of a growing number of collisions with **boats**. A system to warn boaters of the presence of **manatees**, that can signal to boaters that **manatees** are present in the immediate vicinity, could potentially reduce these boat collisions. In order to identify the presence of **manatees**, acoustic methods are employed. Within this paper, three different detection algorithms are used to detect the calls of the West Indian manatee. The detection systems are tested in the laboratory using simulated manatee vocalizations

from an audio compact disk. The detection method that provides the best overall performance is able to correctly identify ~96% of the manatee vocalizations. However, the system also results in a false alarm rate of ~16%. The results of this work may ultimately lead to the development of a manatee warning system that can warn boaters of the presence of **manatees**. (15 refs).

**Descriptors**

acoustic-measurement; acoustic-signal-detection; bioacoustics; biocommunications;  
underwater-acoustic-propagation.

**Keywords**

acoustic detection; manatee vocalizations; West Indian manatee; trichechus manatus latirostris; boat collisions; detection algorithms; false alarm rate.

**Classification codes**

A8736 (Speech and biocommunications).  
A4360 (Acoustic signal processing).  
A8750B (Interactions of biosystems with radiations).  
A4385G (Measurement by acoustic techniques).  
A4320 (General linear acoustics).  
A4330 (Underwater sound).

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**Digital object identifier**

<http://dx.doi.org/10.1121/1.1598196>.

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**INSPEC - 1969 to date (INZZ)**

**Accession number & update**

6262243, A1999-13-8734-025; 19990601.

**Title**

The underwater audiogram of the West Indian manatee (*Trichechus manatus*).

**Author(s)**

Gerstein-E-R; Gerstein-L; Forsythe-S-E; Blue-J-E.

**Author affiliation**

Dept of Psychol, Florida Atlantic Univ, Boca Raton, FL, USA.

**Source**

Journal-of-the-Acoustical-Society-of-America (USA), vol.105, no.6, p.3575-83, June 1999. , Published:  
Acoust. Soc. America through AIP.

**CODEN**

JASMAN.

**ISSN**

ISSN: 0001-4966, CCCC: 0001-4966/99/105(6)/3575/9/ (\$15.00).

**Availability**

SICI: 0001-4966(199906)105:6L:3575:UAWI; 1-I  
Electronic Journal Document Number: S0001-4966(99)02005-6.

**Publication year**

1999.

**Language**

EN.

**Publication type**

J Journal Paper.

**Treatment codes**

X Experimental.

**Abstract**

The hearing thresholds of two adult **manatees** were measured using a forced-choice two alternative paradigm and an up/down staircase psychometric method. This is the first behavioral audiogram measured for any Sirenian, as well as the first underwater infrasonic psychometric test with a marine

mammal. Auditory thresholds were obtained from 0.4 to 46 kHz, and detection thresholds of possible vibrotactile origin were measured at 0.015-0.2 kHz. The U-shaped audiogram demonstrates an upper limit of functional hearing at 46 kHz with peak frequency sensitivity at 16 and 18 kHz (50 dB re: 1  $\mu$  Pa). The range of best hearing is 6-20 kHz (approximately 9 dB down from maximum sensitivity). Sensitivity falls 20 dB per octave below 0.8 kHz and approximately 40 dB per octave above 26 kHz. The audiogram demonstrates a wider range of hearing and greater sensitivity than was suggested from evoked potential and anatomical studies. High frequency sensitivity may be an adaptation to shallow water, where the propagation of low frequency sound is limited by physical boundary effects. Hearing abilities of **manatees** and other marine mammals may have also been shaped by ambient and thermal noise curves in the sea. Inadequate hearing sensitivity at low frequencies may be a contributing factor to the **manatees'** inability to effectively detect boat noise and avoid collisions with **boats**. (35 refs).

**Descriptors**

hearing.

**Keywords**

underwater audiogram; West Indian manatee; Trichechus manatus; hearing thresholds; two alternative forced choice paradigm; up down staircase psychometric method; Sirenian; underwater infrasonic psychometric test; vibrotactile origin; U shaped audiogram; peak frequency sensitivity; functional hearing; physical boundary effects; thermal noise curves; Inadequate hearing sensitivity; boat noise; 0.4 to 46 k Hz; 0.015 to 0.2 kHz.

**Classification codes**

A8734 (Audition).

**Numerical indexing**

frequency: 4.0E+02 to 4.6E+04 Hz, 1.5E+01 to 2.0E+02 Hz.

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14	399265	acoustic or sonic or ultrasonic or ultra adj1 sonic	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 09:31
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22	131953	367.clas. or 340.clas. or 116.clas	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:33
23	274	((control) with (vessel or ship or boat)) same (underwater or marine or ocean or sea) and (367.clas. or 340.clas. or 116.clas)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:34
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26	1	((sea adj1 dog\$1) or turtle\$1 or manatee\$1 or doplhin\$1 or ((underwater or sea or ocean) near2 (creature\$1 or mammal\$1 or animal\$1)) same (accident\$1 or danger)) and ((automatic or automatically) with (control) with (vessel or ship or boat)) same (underwater or marine or ocean or sea))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:36
25	221	((automatic or automatically) with (control) with (vessel or ship or boat)) same (underwater or marine or ocean or sea)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:51
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28	2944	(sea adj1 dog\$1) or turtle\$1 or manatee\$1 or doplhin\$1 or ((underwater or sea or ocean) near (creature\$1 or mammal\$1 or animal\$1)) same (accident\$1 or danger) same collision\$1	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:54
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31	115	(sea adj1 dog\$1) or manatee\$1 or doplhin\$1 or ((underwater or sea or ocean) near (creature\$1 or mammal\$1 or animal\$1)) same (accident\$1 or danger) same ((avoid or avoidance) near2 collision\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:56
32	115	(sea adj1 dog\$1) or manatee\$1 or doplhin\$1 or ((underwater or sea or ocean) near (creature\$1 or mammal\$1 or animal\$1)) same (accident\$1 or danger) same ((avoid or avoidance) near2 collision\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:57
33	2	((sea adj1 dog\$1) or manatee\$1 or doplhin\$1 or ((underwater or sea or ocean) near (creature\$1 or mammal\$1 or animal\$1))) same (accident\$1 or danger) same ((avoid or avoidance) near2 collision\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 10:57

L Number	Hits	Search Text	DB	Time stamp
1	593	367/135-136.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:49
2	851	340/565-566.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:50
3	1372	367/135-136.ccls. or 340/565-566.ccls.	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:50
4	422	manatee or ((marine or underwater or water) adj1 mammal\$1)	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:50
5	3	(367/135-136.ccls. or 340/565-566.ccls.) and (manatee or ((marine or underwater or water) adj1 mammal\$1))	USPAT; US-PGPUB; EPO; JPO; DERWENT	2004/02/03 13:50